SECTION IV.—RIVERS AND FLOODS.

RIVERS AND FLOODS, MARCH, 1915.

By ALFRED J. HENRY, Professor in charge of River and Flood Division.

[Dated: Washington, D. C., May 1, 1915.]

A single rainstorm, that of March 3–6, caused floods in the rivers of Arkansas, also in the Red River at Fulton, Ark., and in the streams tributary to the Red in western Arkansas. The Arkansas River was slightly above the flood stage at one or two points along its course through Oklahoma and Arkansas; however, little damage was sustained. The same storm, in passing across the Carolinas, caused moderate floods in the rivers of South Carolina. The loss sustained in South Carolina and in Arkansas appears in the small table below.

Loss from floods, March, 1915.

State or district.	Bridges, highways, etc.	Live stock.	Loss of land by caving banks.	Value of warnings.
South Carolina	$200	$222	.....	$15,780
Red River	17,400	7,000	$12,000	45,500

SNOWFALL AT HIGH ALTITUDES, MARCH, 1915.

[As summarized from the reports of Section Directors.]

Arizona.—There was heavy snowfall in the mountain districts early in the month, followed by unsettled weather with occasional lighter falls throughout the first decade. It held cold after the storms of February until near the middle of the month. For this reason the accumulated snow of February and March settled but little and was much drifted. The packed snow was chiefly that remaining from the storms of earlier winter months. By March 10, at altitudes above 7,500 feet, the snow had reached greater depths than had been known in many years, if ever before since settlement by whites. This was attributable both to the usual storms of February, supplemented by the fall during early March, and the persistent cold weather. With bright warmer weather there was much daytime melting during the last half of March. Below 7,500 feet the snow disappeared rapidly. Between 8,000 and 9,500 feet, while there was a marked decrease in actual depth there was but little loss in water content. At the close of March there was more snow at high levels than for many years past, all streams were running fairly full from the melting at moderate levels.

California.—The snowfall in the mountains during March, 1915, was very light except in portions of southern California, where average amounts were reported. The deficiency was marked in the Sierra Nevada and Siskiyou ranges. The heavy snow of the preceding months was well packed and there was very little run-off, leaving at the close of the month more than the average amount of solid snow on the ground at the higher levels. All reports showed a large amount of snow in the higher mountains, which at this time of the year would indicate an ample supply of water for irrigation and power purposes.

Colorado.—Weather conditions during March were not favorable to a material increase in the amount of snow at high elevations. As compared with the normal, the snowfall for March was deficient throughout the western counties and the mountain region, except in the vicinity of Longs Peak. The deficiency was marked on the Rio Grande and San Juan watersheds, and over a considerable area on the Gunnison, Grand, and northwestern watersheds. A marked deficiency also occurred at the head of the Arkansas. The streams were higher than common, as frozen ground prevented the taking up of the usual amount of moisture.

At the end of March the average water equivalent of the snow and the water equivalent at the corresponding date a year ago were, respectively, as follows: South Platte watershed, 2.06 and 5.30 inches; North Platte, 4.27 and 4.90; Arkansas, 3.90 and 4.10; Rio Grande, 3.93 and 4.90; Grand, 4.59 and 6.50; Gunnison, 5 and 7.20; Yampa, 5.41 and 6.60; and San Juan, 4.22 and 3.40

Idaho.—Following an unusually dry summer, the winter of 1914–15 was the driest on record for Idaho; the precipitation for the five-month period ending March 31 amounting over the State to but 5.73 inches. The forepart of the winter was cold; hence the snow falling in that period was light and dry. February and March were abnormally mild, with most of the precipitation in the form of rain. The average snowfall for March was the least on record, and, except over small areas, there were no material additions to the snow supply during the month. The continued mild temperature caused the snow to disappear except in the higher mountains, but no high water was experienced. The outlook is for a small flow of water during the season.

Montana.—March was the fifth successive month with deficient precipitation throughout the State and deficient snowfall in the mountain districts. The average precipitation for the State for this period as a whole was the least during the last 20 years, and it is the consensus of opinion of foresters, miners, and others familiar with snow conditions this year and in the past that there was less snow in the mountains at the close of March than for many years. This deficiency is somewhat accentuated by the fact that the year 1914 was generally deficient in precipitation.

Nevada.—This month's snowfall was greater than that of March, 1914, yet as compared with the normal there was deficiency ranging from 62 per cent in the Carson Basin to 81 per cent in the Walker Basin. At the close of the month there was less snow on the ground than usual, except at Tahoe, Cal., where it was normal. The accumulated winter's snowfall had practically disappeared by the 31st at most stations except in the Truckee Basin. The prospects for an ample water flow next summer in the Truckee Basin are good.

New Mexico.—There were general and frequent snowstorms during the first 20 days of March, along with much cold, cloudy, favorable weather, although the gradual advance of the season settled and melted the snow considerably. The average fall for the State was more than 11 inches, an amount that brings the seasonal fall up to 38.4 inches, nearly twice the normal. The clear, warm

weather of the last decade caused rapid melting and settling, and little snow remained below the 7,000-foot level at the end of the month. The highest districts showed a decrease of nearly one-half in the stored depth, indicating the loose character of the snow and its early passage into the streams of the State.

Oregon.—During every month of the past winter the snowfall was less than the average, and in many places it was less than the amount in any one of the last 10 or more years. December and January were cold months, having protracted periods with east winds, and the snow that fell had a small water content. February and March were mild months, and the water content of the snow was good, but the amount was small and much melting took place, so that at the end of March none was left except at high altitudes, and some of the southern slopes at relatively high altitudes were bare of snow. There will be a shortage of water for irrigation and placer mining during the late spring and early summer, and spring freshets will be of short duration.

South Dakota.—The average snowfall at 21 stations in the elevated regions of South Dakota—that is, the Black Hills region of the State—was 11.9 inches, which is about normal; however, there was a marked difference between the various amounts recorded. In parts of Lawrence and Fall River counties the accumulated amount for the month was nearly 2 feet, while in parts of Butte and Custer counties it was less than 4 inches. The average depth of snow on ground on the 15th was about 7.5 inches and at the end of the month about 7 inches. These amounts are somewhat smaller than at the corresponding times in February. The snow generally was packed very hard, and consequently contained much water. There will apparently be an ample amount of water for irrigation purposes. The streams were generally frozen over.

Utah.—In the Great Salt Lake watershed only a few correspondents reported that the snow stored in the mountains was equal to the average amount; most correspondents reported that the snow was unusually short and that the prospects were for a dry season if the irrigating water was not supplemented by rain during the summer. A very careful snow survey of City Creek Canyon showed that there was one-third less snow there than last year and that the snow was in condition for early melting.

In both the Sevier Lake and southern portion of the Colorado River watersheds the outlook was very promising, and some observers reported that the creeks were already bank full. A shortage was reported in the Green River watershed.

In the national forests of the State the snow was below normal in most places and in a favorable condition for early melting.

Washington.—The snowfall in the mountains and elevated valleys for the month of March was unusually light and was the least on record for this section. The month was remarkably mild in temperature and there were warm rains on the slopes and in the valleys. Hence the snow melted rapidly and by the middle of the month it had gone from the valleys and southern slopes, and at the end of the month there was no snow except on the summits, wooded northern slopes, and where it was packed in draws and gulches.

Wyoming.—Snowfall during the month of March was irregularly distributed. Depths on the watersheds of the Big Horn, North Platte, Powder, and Yellowstone rivers were substantially increased. No change in depth occurred on the watersheds of the Green, Snake, and Tongue rivers, while on the Cheyenne River and in the Yellowstone Park less snow lay on the ground than at the end of February. While the mean temperature for the month was below normal, there were many days on which melting occurred to a marked degree. The run-off was inappreciable, and subsequent freezing improved the condition of the snow for slow melting. Except for local irrigation, indications point to less than the normal amount of water from all watersheds. A marked deficiency is indicated for the Snake River and all streams taking their rise in Yellowstone Park.

MEAN LAKE LEVELS DURING MARCH.

By UNITED STATES LAKE SURVEY.

[Dated: Detroit, Mich., Apr. 6, 1915.]

The following data are reported in the "Notice to Mariners" of the above date:

Data.	Lakes.			
	Superior.	Michigan and Huron.	Erie.	Ontario.
Mean level during March, 1915:	*Feet.*	*Feet.*	*Feet.*	*Feet.*
Above mean sea level at New York	601.50	579.57	571.37	245.27
Above or below—				
Mean stage of February, 1915	−0.20	−0.01	−0.04	+0.28
Mean stage of March, 1914	−0.42	−0.41	−0.11	−0.40
Average stage for March, last 10 years	−0.13	−0.56	−0.38	−0.63
Highest recorded March stage	−0.78	−3.38	−2.48	−2.54
Lowest recorded March stage	+0.84	+0.46	+0.54	+0.97
Probable change during April, 1915	0.0	+0.3	+0.7	+0.6